

REMEDIAL ACTION PILOT WORK PLAN

**ROBERT BOSCH TOOL CORPORATION
LEITCHFIELD DIVISION BUILDING #1
410 EMBRY DRIVE
LEITCHFIELD, KENTUCKY
AGENCY INTEREST # 1579**

Submitted to:

**Kentucky Department for Environmental Protection
Division of Waste Management
Superfund Branch**

Prepared by:

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MACTEC Project 6680-04-9537-04

August 2009





engineering and constructing a better tomorrow

August 17, 2009

Mr. Christopher Jung, P.G.
Hazardous Waste Branch
Division of Waste Management
Kentucky Department for Environmental Protection
200 Fair Oaks Lane
Frankfort, Kentucky 40601-1190

Subject: **Remedial Action Work Plan
Robert Bosch Tool Corporation
Former Leitchfield Division Building #1
410 Embry Drive
Leitchfield, Grayson County, Kentucky
Agency Interest # 1579
MACTEC Project 6680-04-9537-04**

Dear Mr. Jung:

On behalf of our client, Robert Bosch Tool Corporation, MACTEC Engineering and Consulting, Inc. (MACTEC) is pleased to submit this Remedial Action Work Plan for the subject site. This Remedial Action Work Plan has been prepared as discussed in MACTEC's *Status Report of Additional Investigations, Robert Bosch Tool Corporation, Leitchfield Division Building #1, 410 Embry Drive, Leitchfield, Grayson County, Kentucky, Agency Interest #1579, MACTEC Project 6680-04-9537-03*, dated September 19, 2008.

Should you have any questions, please do not hesitate to contact the undersigned.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.

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1.0 INTRODUCTION

This Draft Remedial Action Pilot Work Plan (Work Plan) has been prepared by MACTEC Engineering and Consulting, Inc. (MACTEC) at the request of Robert Bosch Tool Corporation (RBTC) for the RBTC Leitchfield Division Building #1 facility. The facility is located at 410 Embry Drive in Leitchfield, Kentucky (Figure 1).

1.1 SITE BACKGROUND

The subject property consists of an approximate seven-acre tract developed with an 86,000 square foot vacant manufacturing facility, hazardous waste accumulation building, solid waste dumpster storage building, small outbuildings, and associated driveways and parking areas. The property is located approximately 800 feet west-northwest of the intersection of Embry Drive and Salt River Road in Leitchfield, Grayson County, Kentucky.

The subject property was constructed in 1969 and commenced operations in 1970 in a 43,000 square foot manufacturing building. The facility originally manufactured screw driver bits, carbide drill bits, and carbide-tipped circular saws. The facility was expanded in 1974 to its current size of 86,000 square feet. From 1986 to 1996 hedge trimmers were also manufactured at the facility. Processes formerly performed at the plant included metal working and grinding, chrome and nickel plating, vapor degreasing, and salt heat treating.

In 1991, during an excavation for a sump to house the central coolant system (Henry Filter), excavation materials (soil, sand, and cement) impacted by trichloroethene (TCE) were encountered. The source of the TCE-impacted materials was reportedly from degreasing operations. Approximately 100,000 pounds of TCE-impacted excavation materials were transported from the site and properly disposed.

1.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

In late 2003-early 2004, MACTEC performed a Phase I Environmental Site Assessment (ESA) of the facility as documented in MACTEC's Report of Phase I Environmental Site Assessment, Robert Bosch Tool Corporation, Leitchfield Division – Building #1, Leitchfield, Kentucky (MACTEC Project 6690-03-9487-03), dated January 20, 2004. Based on the results of the Phase I ESA, MACTEC identified several "recognized environmental conditions (RECs)" and potential RECs.

A Phase II ESA was conducted in November 2004 to determine if historical site operations had impacted the soil and/or ground water at the site. The Phase II ESA activities included the collection of ten shallow soil samples and nine deep soil samples, the installation of four temporary monitoring wells, the collection of one water sample from the Henry Filter area, the collection of five groundwater samples, and the collection of two surface water samples. The soil and groundwater samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons, oil and grease (TPH-O&G) and the eight Resource Conservation and Recovery Act (RCRA) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver).

Additional Phase II ESA activities were performed during 2007 and 2008 to further delineate the areas of concern identified in the initial Phase II ESA.

In March 2007, assessment activities included advancement of 18 direct-push technology (DPT) soil borings in two areas of the site, collection of nineteen soil samples for analysis of VOCs (all samples) and TPH-O&G (Hazardous Waste Accumulation Building only), and installation of eight permanent monitoring wells (MW-1 through MW-8) in the overburden outside the building to the southwest, west, northwest, north and northeast. Groundwater samples were collected from the eight overburden monitoring wells (analyzed for VOCs and the eight RCRA metals) and from the two onsite production wells, PW-1 and PW-2 (analyzed for VOCs only). One additional sample of surface water (labeled SEEP) was collected from the seepage entering the concrete ditch that runs along Embury Road on the north side of the building. The report concluded that two localized areas of TCE-impacted soil exist at the former Hazardous Waste Accumulation Building and the Flat Bed Grinder Area. A release of TCE to groundwater at the site was indicated, based on the widespread presence of chlorinated volatile organic compounds (CVOCs), including TCE and its degradation products, in groundwater sampled from the eight monitoring and two former supply wells. The report recommended additional investigations to more completely define the extent of contamination, identification of source areas in soil and shallow groundwater, and conducting a receptor survey to identify human receptors and/or ecological resources potentially impacted by the presence of TCE and related compounds in groundwater.

During May and June 2008, additional investigation activities included a receptor survey, the advancement of 64 DPT borings including the installation of 49 temporary monitoring points in selected DPT borings, the installation of 15 permanent monitoring wells, and the collection of soil samples and groundwater samples. The receptor survey did not identify any human receptors or ecological resources potentially affected by groundwater impacts at the site. Soil impacts were found primarily in the vicinity of the Henry Filter, with some lesser sources located at the Maintenance Area and the northern portion of the building. Based on field hydraulic conductivity (slug) testing, hydraulic conductivity ranged from 0.011 to 3.7 feet/day in the shallow groundwater zone and appears to increase with depth and nearness of the screen to the soil/bedrock interface.

The soil boring locations and the water sampling locations are shown on Figure 2. The analytical results for the soil samples collected during the previous environmental investigations are summarized in Table 1. The analytical results for the groundwater samples collected during the previous environmental investigations are included in Table 2.

As shown in Table 1, the concentration of TCE reported in the soil samples collected from borings SB-3, SB-8, GP-1, GP-19, GP-26, GP-27, GP-28, GP-31, GP-37, GP-39, GP-44, and GP-53 exceeded the United States Environmental Protection Agency (EPA) Region IX Preliminary Remediation Goal (PRG) for residential soils. As shown in Table 2, VOCs were reported at concentrations exceeding the EPA National Primary Drinking Water Standards Maximum Contaminant Levels (MCLs) in water samples collected from 21 out of 23 permanent monitoring wells, 39 of the 49 temporary monitoring wells installed in DPT borings, as well as standing water below the floor slab at the Henry Filter sump (HF-1), and two inactive former supply wells (PW-1 and PW-2). Figure 2 shows the concentrations of total CVOCs detected in shallow groundwater at the site during the previous environmental investigations.

Based on the information obtained during the previous environmental investigations, the following conclusions were presented in the Status Report of Additional Investigations (MACTEC, September 19, 2008):

- Based on interviews and a review of available records, MACTEC did not identify any human receptors or sensitive ecological resources potentially affected by water quality impacts at the RBTC LDB#1 site.

- The shallow subsurface at the site consists of silty clay overburden soils grading downward into shale bedrock with thin hard limestone and sandstone interbeds. Relatively unweathered rock is encountered at variable depths ranging from 4.5 to 18.5 feet below ground surface (bgs).
- Most of the flow in the shallow groundwater zone appears to occur in relatively localized zones in the vertical profile where shale partings in the rock or relict structures in the clay are relatively open. Secondary permeability (and pathways for contaminant migration) may be provided by vertical fracturing and associated troughs in the bedrock surface.
- The upper bedrock zone (at the soil/bedrock interface) appears to be somewhat more permeable than the overlying silty clay soil, and to offer the primary pathway for lateral groundwater flow and contaminant migration in the shallow groundwater zone.
- The overall direction of groundwater flow in the shallow zone is to the north and northeast, in the general direction of the topographic gradient and pre-construction drainage. A bedrock high occurs under the southeastern portion of the plant, probably representing a pre-construction topographic divide, and little to no groundwater flow occurs in this area.
- Two former water supply wells (PW-1 and PW-2) are present at the plant, and are finished at total depths of 375 and 475 feet bgs, respectively. Based on water level measurements in these wells, there is a significant downward vertical gradient in the deeper bedrock. Insufficient data exists to fully evaluate the degree of hydraulic connection between the shallow and deep flow systems and pathways for migration between the two.
- The constituents of concern (COCs) in soil at the site are TCE (the only CVOC detected above EPA Region IX Residential PRGs in soil) and TPH-O&G (locally in selected areas of the site).
- The source area for TCE impacts, under the west central portion of the plant, appears to be associated with materials handling processes in the area of the former degreaser (on the north side of the Henry Filter pit), and just outside the original building, which ended just south of the plating room.
- Minor source areas for TCE were also identified at the former Hazardous Waste Accumulation Building, the Flat Bed Grinder Area, the Maintenance Area (southwest corner of the plant), and the northern (east and center) portion of the building interior.
- The highest concentrations of TPH-O&G have been identified just below the pavement at the former Hazardous Waste Accumulation Building. Minor source areas of TPH-O&G were also identified at the Maintenance Area, Circular Saw Blade Grinding Area, near the Henry Filter pit, in the northern portion of the plant, and outside the plant to the west.
- The COCs in groundwater identified on the basis of the cumulative analytical data are the CVOCs TCE, cis-1,2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethene

(1,1-DCE) and vinyl chloride (VC), based on concentrations and frequency of detection over the groundwater screening levels. Groundwater impacts from TPH-O&G and metals are not significant.

- CVOC impacts in shallow groundwater are widespread across the site. The highest groundwater concentrations, greater than 100 milligrams per liter (mg/L), are associated with the soil source area identified under the west-central portion of the plant, in the area of the former degreaser (north side of the Henry Filter pit) and the south wall of the original plant.
- CVOC concentrations have been found to be higher in shallow groundwater than in soil in the source area (e.g., 421 mg/L compared to 110 milligrams per kilogram [mg/kg] in GP-26), and are generally one or more orders of magnitude higher in groundwater than in soil in the rest of the plume area.
- The presence of TCE degradation products in the plume, which generally increase as a percent of total CVOCs with distance from the source area, indicates reductive dechlorination (natural attenuation) is occurring.
- The May-June 2008 investigations focused on the area of the plant building, and the full extent of CVOC impacts in shallow groundwater has not been defined to the east and northeast or at the western boundary (where further definition in the direction of the Campbell Hausfeld facility is impractical due to site topography).
- The mechanisms for contaminant migration in the area of the shallow plume are not completely understood, but appear to be related to the combined effects of man-made conduits (subsurface utilities) and bedrock structure (fractures and troughs).
- In the source area under the west-central portion of the plant, total CVOC concentrations in groundwater decrease with depth, based on the results from one round of groundwater samples collected from two sets of well pairs.
- CVOCs have been detected in both the deep former supply wells (PW-1 and PW-2). The presence of CVOCs in the deep wells may have resulted from deep fracturing in combination with a downward vertical gradient, or possibly from incomplete sealing of the former supply well casings, which may have acted as conduits for downward migration from the shallow zone.
- Site conditions favor corrective actions focusing on groundwater rather than soil, due to the presence of higher concentrations of CVOCs in groundwater than in soil.

In August 2008, subsequent to the review of the Status Report, MACTEC performed a preliminary evaluation of potential remedial alternatives, on behalf of RBTC. Included in the evaluation were in-situ application of nanoscale iron powder, in-situ application of emulsified zero-valent iron (EZVI), in-situ application of Trap and Treat BOS 100®, in-situ air sparging with soil vapor extraction (AS-SVE), dual-phase extraction (DPE), and biostimulation.

Based on the results of the preliminary evaluation, including technical effectiveness and cost, two of these corrective measures alternatives were selected for pilot testing – biostimulation and Trap and Treat BOS 100®.

MACTEC is currently conducting additional assessment activities at the site. In March 2009, 15 DPT borings were advanced in the eastern and northeastern portions of the site. Soil samples were collected from the borings and temporary monitoring wells were installed. Soil and groundwater samples were field screened for chlorinated hydrocarbons using the Color Tec method. Six groundwater samples and eight soil samples were sent to a fixed-based laboratory for analysis. Based on the Color Tec and laboratory analytical results, four mid-level groundwater monitoring wells (MW-2M, MW-5M, MW-8M and MW-13M) and three shallow monitoring wells were installed (MW-22, MW-23, and MW-24) in April 2009. Groundwater samples were collected from the newly installed monitoring wells in May 2009.

1.3 SCOPE AND PURPOSE OF WORK PLAN

This Work Plan has been prepared for submittal to the Kentucky Division of Waste Management (KDWM) Superfund Branch to address pilot-scale corrective action activities proposed for the referenced facility. The purpose of the Work Plan is to identify a scope of work, implementation and monitoring plan, and estimated schedule for pilot-scale treatment of hazardous constituents in groundwater, concurrent with continued assessment work at the site. Selection of long-term remedial measures for the site will be based on the results of the pilot study described herein, as well as the results of the additional assessment work.

This Work Plan includes selection of pilot treatment areas, implementation procedures, and monitoring of treatment effectiveness.

1.4 WORK PLAN ORGANIZATION

This Work Plan is designed to provide a stepwise approach for pilot testing of the selected remedial alternatives for groundwater treatment. The identified scope of work and monitoring plan are designed to meet these objectives by identifying suitable testing areas, detailing the testing procedures, and detailing remediation effectiveness monitoring procedures.

The Work Plan is divided into six sections. Section 1.0 provides an introduction to the site, a summary of previous environmental investigations, the general scope and purpose, summary of the Work Plan organization, and Work Plan Guidance Documents. Section 2.0 includes a statement of the Work Plan objectives, pilot testing strategy, a summary of site health and safety documentation and procedures, and reference to quality control measures. Section 3.0 presents the implementation procedures and scope of work for pilot-phase remediation of groundwater. Section 4.0 provides a brief description of the contents included in the proposed Remedial Action Pilot Phase Report. Section 5.0 provides for an estimated schedule for conducting the identified scope of work. Section 6.0 provides additional references used in the completion of this Work Plan.

1.5 WORK PLAN GUIDANCE DOCUMENTS

This Work Plan has been prepared using the following documents for guidance:

- Kentucky Natural Resources and Environmental Protection Cabinet (KNREPC), January 8, 2004: Kentucky Guidance for Ambient Background Assessment.

- KNREPC, January 15, 2004: Kentucky Guidance for Groundwater Assessment Screening.
- Parsons Corporation, August 2004, “Principles and Practices of Enhanced Anaerobic Bioremediation of Chlorinated Solvents”
- Parsons Engineering Science, August 1998, “Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water”
- EPA, October 1, 2002: Region IX Preliminary Remediation Goals
- EPA, Office of Solid Waste and Emergency Response, 1998: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd Editions, Final Update III, SW-846.